PZT Driver -Quick Start Guide
LIGO-T070063-01-C
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Hardware Revision Applicability–Revision LIGO-D060283-B1 HV Driver. Unit complies with T060123, LIGO Standard Electrical Interfaces.

1. Overview

1.1. The PZT driver (LIGO-D060283-B1) provides the high voltage (0 to 300V) drive for Piezo Transducers. **This chassis contains potentially lethal voltages. Extreme care must be used.** Each unit can be tailored for use over a specific operating voltage range.

1.2. The piezo drive can be modulated for dither locking at frequencies from 2 to 20 kHz. Dither modulation can be applied from a DAC (Digital to Analog) interface, or from a front panel BNC.

1.3. The piezo output drive has two separate voltage monitors – a DC coupled monitor, and an AC coupled monitor.

2. Electrical Interfaces

2.1. All **front panel inputs** are true-differential, bipolar +/- 10 volt range. The input impedance is 10k ohms on all inputs. Inputs voltages should be limited to +/- 15 volts to avoid damage.

2.2. All **front panel outputs** are fully differential +/- 10 volt range. Load impedances should be greater than 1k ohm.

2.3. The required **low voltage power supply** is nominally +/- 18 VDC @ 0.1 amps. A range of voltages from +/-16 to +/- 24 is acceptable.

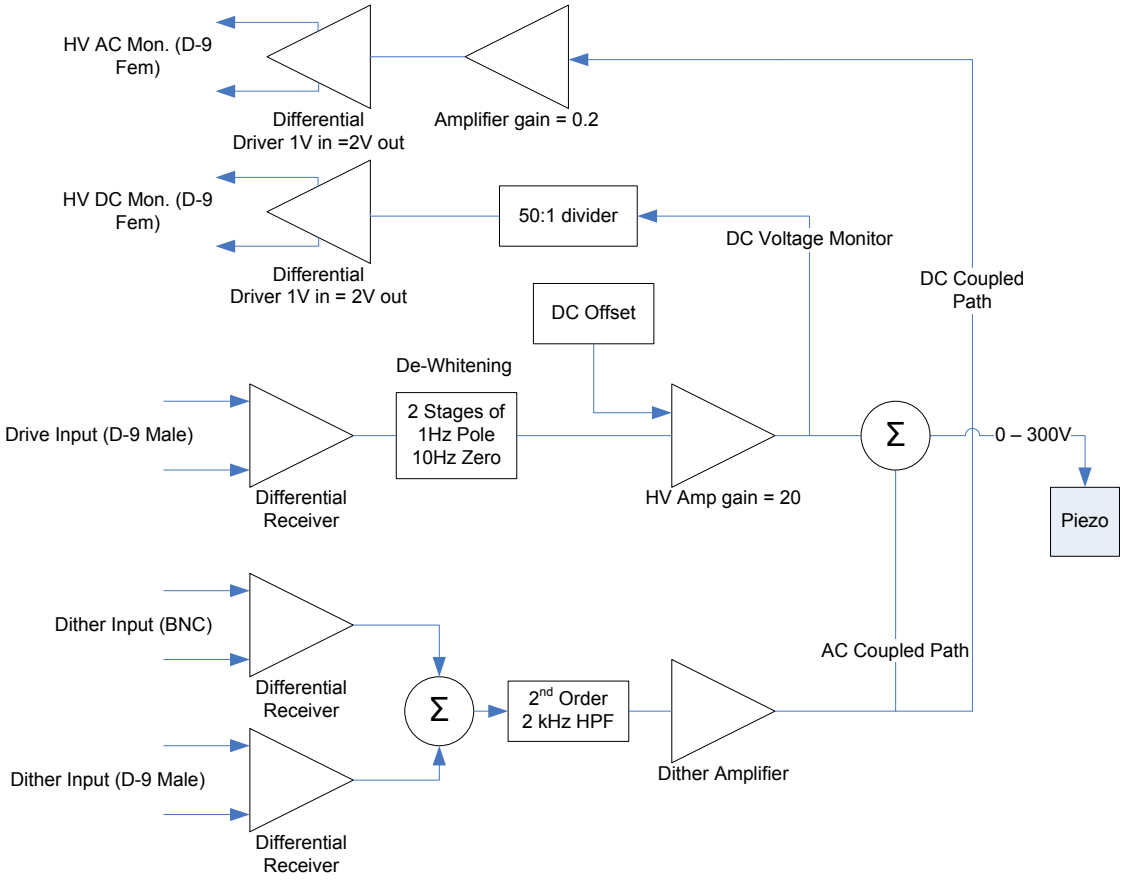
2.4. The maximum **high voltage power supply** is 300 VDC +/- 5% with a current capacity of at least 10mA. There is no minimum HV supply voltage beyond that set by the application.

2.5. The nominal **piezo load capacity** is 0.22 uF +/- 20%, but there is no real restriction due to damage provided the user is aware of the circuit output impedance effects.

2.6. Detailed **electrical schematics** are available in LIGO document D060283-B1

3. **Figure 1** shows an overview of the PZT Driver

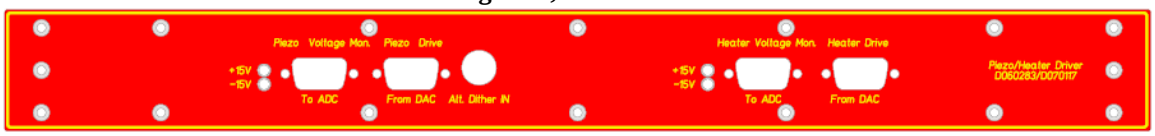
Figure 1



4. Figure 2 and Figure 3 show the front and rear of the PZT and Heater driver chassis. A functional description of each connector associated with the HV driver is provided.

4.1. **Front Panel diagram**

Figure 2, Front Panel



4.2. Front Panel Functions

4.2.1. **Piezo Voltage Mon** – Monitoring for the high voltage output. 1V at the DC monitor is 50V at the HV output for the B1 revision. The other path is configurable, but the MIT prototype had a DC gain of 0.2 amplifier that was intended for looking at the dither signal. No internal filtering of signal on DC path.

4.2.2. **Alt. Dither IN** – A BNC input that provides an alternate path for injecting a 2 kHz to 20 kHz modulation signal used to dither the piezo. Path includes a second order, 2 kHz high-pass filter.

4.2.3. **Piezo Drive** – A D-9, male input for differential voltage drive to the OMC Length Piezo. Two DAC output channels are interfaced by this connector.

4.2.3.1. One channel is used for the length-control function, and other channel is used for a dither function at higher frequencies (identical to section 4.2.2 for the BNC dither input).

4.2.3.2. A differential voltage of 1 volt applied to this input changes the voltage across the piezo by 20 volts. The quiescent high voltage output voltage drive rests at 150V +/-5% when there is no input (0V).

4.2.3.3. A de-whitening filter consisting of 2 poles at 1 Hz and 2 zeros at 10 Hz is included in this path.

4.2.3.4. The current at each HV output is limited internally to 4mA +/- 5%, and the output is electronically protected against an inadvertent output short circuit.

4.3. **Rear Panel Diagram**

Figure 3, Rear Panel

4.4. Rear Panel Functions

4.4.1. **DC IN** – A three terminal input in a D-15 shell. This input supplies the DC power to the chassis. The nominal input is +/- 18 VDC @ 0.2 amps, (shared between the quiescent current of the piezo driver and heater driver that's located in the same chassis) but a range from +/- 16 to +/- 24 VDC is acceptable. This range allows sufficient overhead for the internal low-dropout regulators, but is not so high as to cause a thermal dissipation issue with the regulators. The heater driver draws additional current (~200 mA) when driving the OTAS In-vacuum heater element to the maximum

4.4.2. **+15 & -15 volt LEDs** – When lit, indicate the presence of DC power at the output of the chassis internal regulator board. The chassis has a dual rocker type circuit breaker with a trip point of 1 amp. The dual breaker is the preferred method for turning power on and off.

4.4.3. **DC On/Off** – The chassis has a dual rocker type circuit breaker with a trip point of 1 amp. The dual breaker is the preferred method for turning power on and off. Switch removes power from the input of the power regulator board only.

4.4.4. **To Heater/Piezo** – D-9, female connector providing interface to the Piezo and the low voltage heater element. ***Potentially lethal high voltages (300VDC) are present on this connector***. Extreme care must be employed when working with this connection. On the rear of the chassis the high voltage output is on pins 3/8 for +/- signals respectively. Pairs 1/6 and 2/7 are used for the low voltage OTAS heater. At the board level of the HV driver circuit board inside the chassis, the HV output of the circuit board is on a Molex type connector that has a silkscreen identifier to mark the HV output pins.

4.4.5. **HV Input** – This is the high voltage power supply input to the chassis. Up to 300 VDC @ ≥10 mA is required. Pin 1 is positive, pin 2 is negative.